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यू. आर. राव उपग्रह केन्द्र, विमानपुर, बेंगलूरु - 17 U. R. RAO SATELLITE CENTRE, VIMANAPURA, BENGALURU - 17 ಯು. ಆರ್. ರಾವ್ ಉಪಗ್ರಹ ಕೇಂದ್ರ, ವಿಮಾನಪುರ, ಬೆಂಗಳೂರು - 17

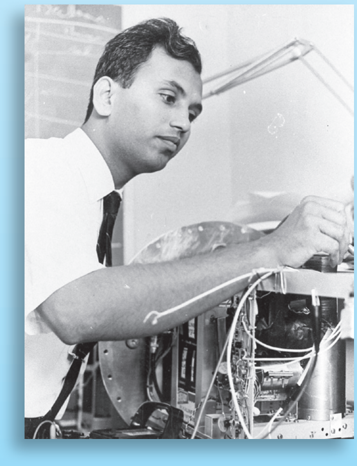
ISRO SATELLITE CENTRE (ISAC) RENAMED AS U.R. RAO SATELLITE CENTRE (URSC)

The man whose name the Centre is named after, Prof. Udupi Ramachandra Rao, more popularly known as U. R. Rao played a stellar role in the unenviable task of building an endogenous space technology capability in India, weathering all the initial difficulties, obstacles and failures he faced and devised unique satellite applications of direct relevance to the country. A rare combination of scientific passion, forthright and an eye for detail, Prof. U. R. Rao, till his last breath kept himself associated with the contemporary Indian Space Missions like Mars Orbiter Mission (MOM) and the upcoming Mission to Sun – Aditya L1.

Returning in 1966 from the famed Massachusetts Institute of Technology (MIT) USA, where he worked as post doc and armed with his exposure to space missions through the Mariner-2, Pioneer 6, 7, 8 and 9 deep space probes and the Explorer 34 & 41 satellites, he carried out research in high energy at the Physical Research Laboratory (PRL).

In the meantime, Prof. Vikram Sarabhai was in the hunt for Indian talent to head the indigenous satellite building activity in the country. He requested Prof. U.R. Rao to prepare a blue print for satellite development and applications. He then successfully egged a reluctant Prof. Rao to spearhead the activity, being the only man in the country at that time with exposure to satellite systems.

He gathered a young team of engineers from the PRL to what was then known as Satellite Systems Division (SSD) in Thiruvananthapuram and started design of a 100 kg satellite for a possible launch on board the USA's scout launch vehicle.



But the scene changed when the erstwhile USSR offered a proposal for enabling India to develop and launch a much bigger satellite.

When the satellite building plan took its shape, with a handful of engineers fresh from college and scarce infrastructure, it is believed that, the work on the **first Indian satellite 'Aryabhata' started on 25th September 1972 (Ganesh Chaturthi).** It requires a man of great gut and confidence to take up this challenge with practically no infrastructure and manpower skills to execute the specialised task on hand. The story of the Peenya Industrial sheds being converted to space grade laboratories, a group of engineers visiting US and hunting for space components, appointment orders to the new recruits being given in hand after the interview, the solicitation and persuasion of industries all over the country to respond to the stringent schedules, the fabled procurement process for equipment and materials now appear to be a folklore – yet they remain

true in the annals of ISAC's history. These seemingly impossible tasks were made possible, single handedly by sheer dint of courage, grit, confidence, vision and the forceful personality of one man - Prof. Rao who as the Project Director of Indo-Soviet Satellite Project (ISSP) enthused, cajoled, led the young team of fresh engineers and managed this arduous task. What followed the successful launch of Aryabhata mirrors Prof. Rao's vision as institution builder. The then Chairman of ISRO, Prof. S. Dhawan is himself on record that he called the grandiose plans of Pof. Rao for a satellite centre as 'a dream' and his project profile 'far fetched'.

The promise of successful Aryabhata project coupled with a concrete scheme for satellite technology development for national development led to the establishment of **'ISRO Satellite Centre (ISAC)' on 3rd November 1976 with Prof. Rao as the founding Director.** Rest is history. But history at best retains not the fire of the past but only the ashes. Hence, it has to be an eulogy on Prof. Rao whose farsightedness and vision has seen ISAC evolve into a Centre of technological excellence.

Prof. U.R. Rao is credited with the systemic structures he created in the complex project management structure for ISRO's Satellite Projects. He introduced the matrix management structure for optimally utilizing scarce resources across the projects ensuring decision making at decentralized levels where expertise lie, while at the same time emphasizing configuration management, system engineering practices with enhanced co-ordination, interface control, quality assurance and effective documentation. This edifice continues to stand firm even to this day at ISAC (now URSC). He led the experimental phase of the Indian Satellite Programme with aplomb and laid the firm foundation for the satellite technology in country. Later, as Chairman, ISRO / Secretary DOS, he successfully ushered in the satellite operational era, and in the process was the cause for devising a number of novel satellite applications tailor made for Indian conditions.

Each brick of the ISAC building would resound with his name for eternity as the hallowed portals of the centre bear his indelible footprints. It is only natural and apt that ISAC – a centre which he built brick by brick through his vision, far sightedness and leadership should be named after him at this juncture as he slips and travels towards eternal boundaries of time and space.

The birth and growth of ISAC from the humble industrial sheds in Peenya to a state of the art global satellite building facility will stand as witness for the indomitable will and clairvoyance of Prof. Rao as an instrumental builder, motivator, leader and a man of substances for the future times to come.

The grateful entire ISAC Community salutes the life, works and memory of its grand Sire in reverence – because his contribution to ISAC is more than many to be recounted and beyond just acknowledgement ISAC itself is renamed as U.R. Rao Satellite Centre with effect from 2nd April 2018.

G N V Prasad, *DD, MISA*

From the Upagrah Committee's Desk

Dear Readers,

Honorable Prime Minister of India renamed ISRO Satellite Centre as U. R. Rao Satellite Centre to commemorate Prof. U. R. Rao, his contributions and dedication towards developing satellite technology in India. This Centre was dream and vision of Prof. U. R. Rao, who sowed the seed in Peenya industrial sheds and replanted it near NAL and HAL when it started flourishing. UPAGRAH team thanks all URSCians who realized his dream with their hard work and sharp skills.

UPAGRAH team has brought out this issue with new ideas. It looks for regular contribution of articles from its readers to make every issue an interesting collector's copy. In this issue, apart from technical articles and events, a page is dedicated to exhibit hidden talents of our employees. We seek suggestions from the readers to make this newsletter more attractive and informative.

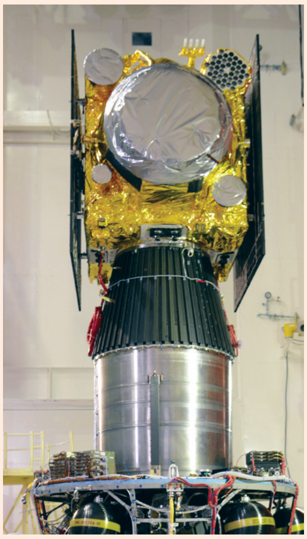
Editorial Committee

PSLV-C41 SUCCESSFULLY LAUNCHES IRNSS-1I NAVIGATION SATELLITE

In its forty third flight, ISRO's Polar Satellite Launch Vehicle PSLV-C41 successfully launched the 1425 kg IRNSS-1I Navigation Satellite on April 12, 2018 from Satish Dhawan Space Centre SHAR, Sriharikota.

Indian Regional Navigation Satellite System(IRNSS) is a major project under Indian Space Research Organization. The baseline constellation (NavIC: Navigation with Indian constellation) already have seven satellites prior to IRNSS-1I launch in the orbit, of which three satellites are in geo-stationary with 5° inclination located at orbital slots of 32.5° E, 83° E and 129.5° E longitudes. The remaining four satellites are in geo-synchronous orbit with 29° inclination located(2 each) at orbital slots of 55° E and 111.75° E longitudes.

The mission objective is to develop an independent satellite based navigation system capable of providing uninterrupted navigation services with position accuracy better than 20m over India and a region extending about 1500km around India. Vehicles and even individuals like trekkers travelling in this region over land, sea or in the air can get very accurate information about their position, velocity and exact time using this system.



IRNSS-1I is the ninth satellite realized in the series, the configuration is similar to earlier IRNSS satellites. The following are the salient features.

Lift off mass : 1425 Kgs

Dry Mass : 596 Kgs

Launch vehicle Interface : 937mm Standard dia.

Power : 2 solar panels generating 1671W, each wing one panel, one Lithium Ion battery with 90AH capacity

Propulsion : Unified bi-propellant system, 440 Newton Liquid Apogee Motor, Twelve 22N thrusters

Control System : Zero momentum based system, Orientation input from Sun and Star sensors; Reaction wheels, Magnetic Torquers and 22 Newton thrusters as actuators

Mission life : > 10 Years

Launch Vehicle : PSLV-C41 XL version

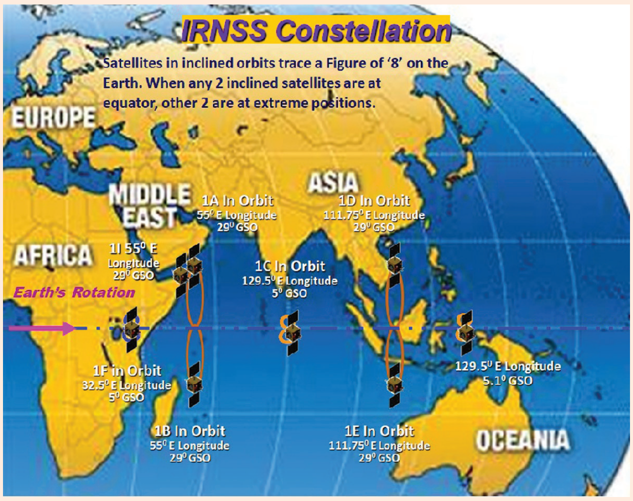
IRNSS-1I satellite has two types of payloads — Navigation and Ranging payload like previous satellite. The navigation payload is a broadcasting type of payload which will transmit navigation service signals to the users and operates in 'S' and 'L5' bands. The ranging payload comprises a CDMA ranging transponder which is used for ranging and operates in C-band. Corner Cube Retro Reflector is also incorporated for Laser ranging.

IRNSS provides two type of services viz. Standard Positioning Service (SPS) and Restricted Service (RS) with encryption (improved version compared to other IRNSS satellites). The navigation payload will transmit the ranging codes being generated on-board with the navigation data up-linked from the ground using TTC transponder. The payload will transmit the signals at L band(1176.45 MHz) & S band (2492.028 MHz). It will radiate total EIRP of 36dBW over 24 MHz bandwidth at L band & 39dBW over 16.5MHz bandwidth at S band for the composite signal.

Seven satellites have already been successfully positioned in the orbit by India's workhorse launch vehicle PSLV (PSLVC22/IRNSS-1A/July 2013, PSLV-C24/IRNSS-1B/April 2014, PSLV-C26/IRNSS-1C/Oct 2014,PSLV-C27/IRNSS-1D/March 2015, PSLV-C31/IRNSS-1E/Jan 2016, PSLV-C32/IRNSS-1F /March 2016, PSLV-C33/IRNSS-1G/April 2016).

IRNSS-1I satellite is ninth in the series which was launched by PSLV-C41 on April 12, 2018 and the satellite was positioned in geo-synchronous orbit with 29° inclination at orbital slot of 55° East.

ISRO Navigation centre, the nerve centre of IRNSS situated at Byalalu, Bengaluru carries out ground calculation and processing of Navigation information. The IRNSS satellites broadcast information about its accurate position as well as time continuously from its orbit. The IRNSS satellite receivers on Earth that receive such information from satellites will process that information to accurately derive their position and velocity. They will also maintain time accurately and the knowledge of such time information is essential for providing safe and faultless navigation data from satellites. For accurate time measurement, IRNSS satellites carry 'Rubidium Clocks' that do not drift as normal electronic clocks do.



IRNSS-1I is the first satellite realised in AIT-2 new clean room at ISITE (ISRO Satellite Integration and Testing Establishment). After the packages integration and pressure hold tests, disassemble mode IST was carried out, followed by this the panels have been assembled and detailed close mode IST was carried out. Subsequently the satellite has undergone thermovacuum test, appendages integration, dynamic tests (vibration and acoustic), radiation tests and post dynamic IST at ISITE.

After PSR the satellite was shipped to SDSC, SHAR for propellant filling, combined operation and launch. IRNSS-1I was successfully launched on April 12, 2018, 4:04am by PSLV-C41 launch vehicle. With successful orbit positioning of IRNSS-1I the planned initial seven satellite constellation - NavIC is operational.

IRNSS-Project team

MULTI-SLIT SPECTRO-POLARIMETER FOR GROUND AND SPACE-BASED SOLAR MAGNETIC FIELD MEASUREMENTS

Space Astronomy Group has been actively engaged in solar physics research using ground and space based observatories. Sun is a dynamic star and often throws plasma and electromagnetic energy in abundance to the inter-planetary medium through flares and coronal mass ejections. This in turn defines the weather in the inter-planetary space especially for the satellites in orbit or traversing the inter-planetary medium. Dynamics of the Sun is greatly defined by the magnetic fields present in it as visibly seen as active regions (sunspots, prominences etc) and also coronal loops (Left Figure below). Hence, studies of magnetic field in the solar atmosphere is a major activity in any solar observing facility and the studies are carried out using spectro-polarimeters.

Recently, Space Astronomy Group (SAG) has developed a high cadence (time sequence) solar magnetic field measuring instrument (called Multi-slit Spectro-polarimeter) that can study the photospheric magnetic field with a cadence 5-times faster than a classical spectro-polarimeters which have been in use for the last two decades. There is only one more such instrument (at the Dunn Solar Telescope, Sunspot, NM, USA) currently operational around the globe. This work will aid the development of the spectro-polarimeter part of Visible Emission Line Coronagraph (VELC) on-board Aditya-L1. VELC is a multi-slit spectro-polarimeter to study the coronal magnetic field from space while the MSSP studies the photospheric magnetic field from ground. A combined observation is envisaged when Aditya-L1 in space to study the atmospheric magnetic field of the Sun especially for active regions. Aditya-L1 is a first dedicated approved Indian space observatory to uninterruptedly study the dynamics of the solar atmosphere (chromosphere and corona in particular) and placed at the Sun-Earth Lagrangian point L1.

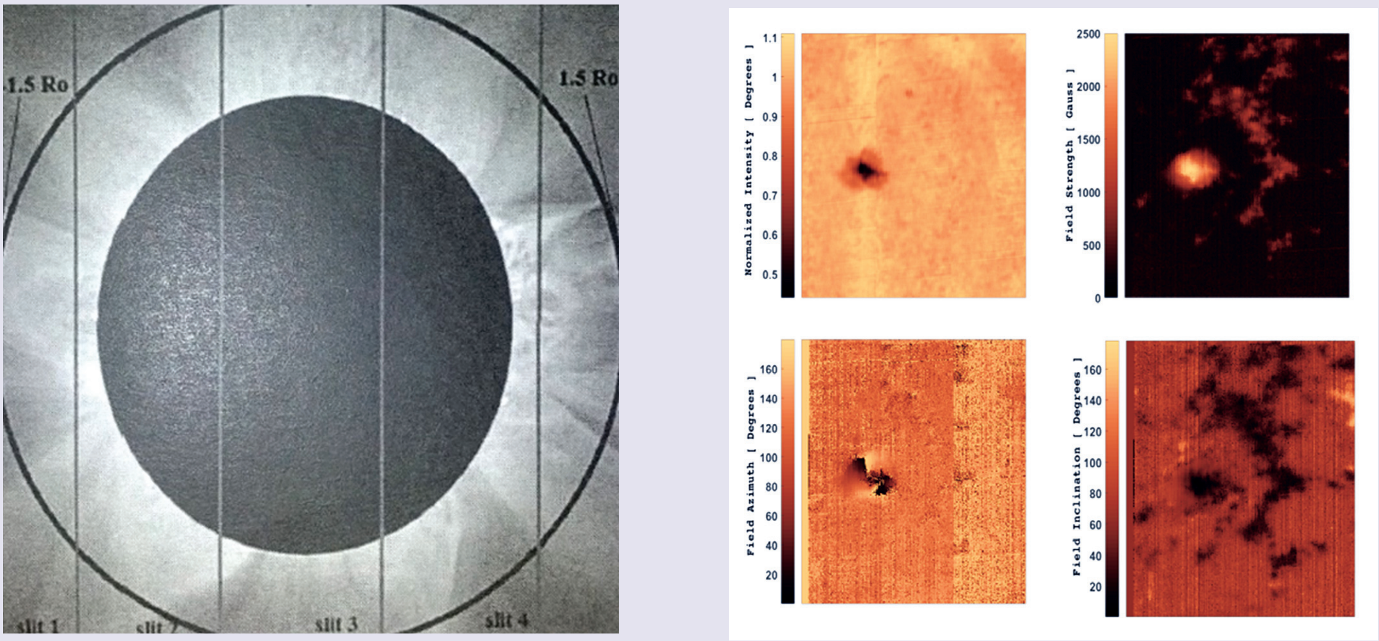


Fig.: (left) Coronal image with multi-slit planned for VELC. (right) Photospheric intensity (top left), magnetic field (top right), line-of-sight inclination (bottom right), and azimuth (bottom left) measured by the MSSP.

Mohana Krishna R *(PhD Student) and* **Dr Sankarasubramanian K,** *SAG*

THE UPAGRAH TEAM CONGRATULATES Dr. M. S. SIVA FOR OBTAINING THIS DOCTORATE DEGREE FROM INDIAN INSTITUTE OF SCIENCE

Dr M. S. Siva, Scientist / Engineer 'G' and Division Head, CDAD-1/CDSG, has been awarded Ph. D. Degree by Indian Institute of Science, Bengaluru for his Thesis titled ***"Integrated Relative Position and Attitude Control of Distributed Spacecraft Formation for High Resolution Imaging".*** The thesis has proposed Innovative Guidance Navigation and Control (GNC) concepts using LMI based Distributed Control and Coordination to ensure stringent spatial positioning of formation group of six satellites and synchronization. The outcome of the thesis is to enhance potential capabilities of Earth observations in terms of best spatial and spectral resolution as well as revisit capabilities required for disaster management. This is presently need of the hour in space technology.

STRANGE NEW WORLDS: EXOPLANET DISCOVERED WITH PARAS AT MT.ABU, PRL

3796 and still counting! The number of planets discovered around other stars has been growing ever since the first discovery in 1995. Planetary formation seems quite a natural follow up to the birth of stars. The dust and debris around young stars if given the time aggregate into planetary objects. So it happened in our Solar System a 4.56 billion years ago. We had a pretty concise picture of the formation of our Solar system which we thought is the norm. But as we begin to probe these faraway worlds we find they are nothing like we have imagined. There are planets as dense as diamonds, many times heavier than Jupiter yet closer than Mercury to the star, primitive ones as old as 13 billion years and systems with not one, not two but three stars and even planets going around pulsars (which are resurrected from dead stars).

Efforts today are being focused on understanding these worlds and comparing it with prevailing theories of Solar System formation. Added to that is the excitement on the possibility of finding a habitable planet; a rocky world with liquid water on the surface just at the right distance from the star (known as the Goldilock's zone).

We can be now proud that India also has added its bit to this hot pursuit with the discovery of a sub-saturn with the 1.2 m PARAS telescope at Mt.Abu which is part of the Physical Research Laboratory (PRL) in Ahmadabad. The team led by Abhijit Chakraborty observed the system for 420 days and show with a method known as Radial Velocity (RV) technique that there is a strong evidence for a transiting sub-Saturn in EPIC 211945201 system with a mass of about 27 times Earth's mass and 6 times its Radii. Only 22 other systems are known today with masses in the range of 10-70 Earth mass. Results are published in the Astronomical Journal (Further reading at http://arxiv.org/submit/2255709/pdf) .

With ground observational facilities in India like at Mt. Abu, Hanle Devasthal etc, the potential is huge for many more discoveries in the future.

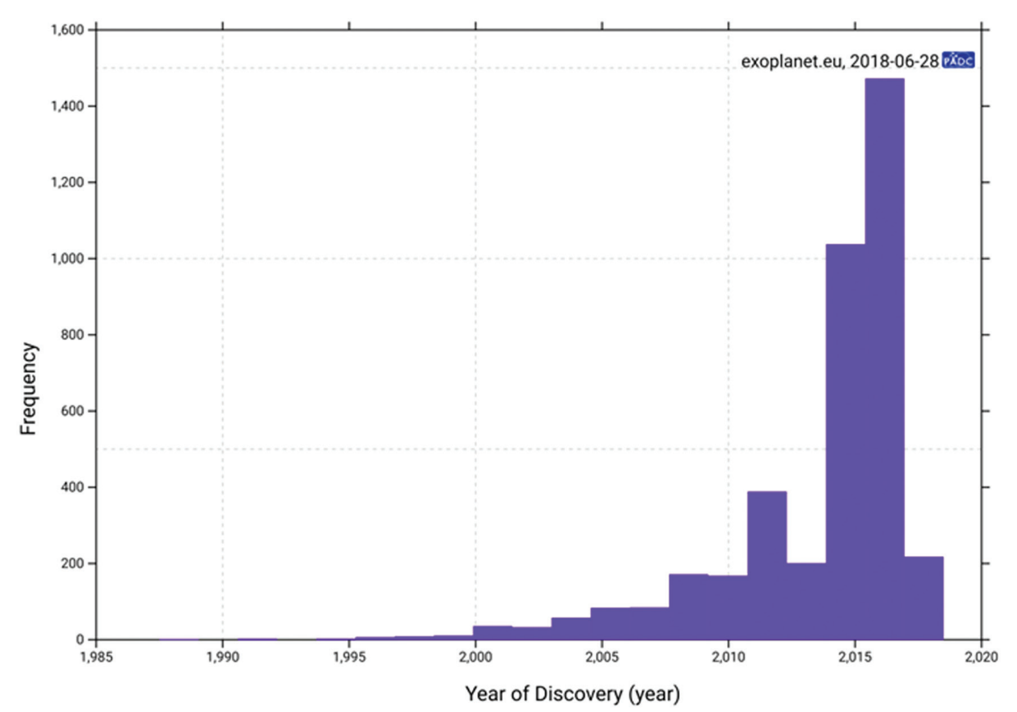


Fig. 1: The ever increasing number of planets discovered over the years (plotted with data from www.exoplanet.eu)

Upagrah team

THE UPAGRAH TEAM CONGRATULATES SHRI. PARTHIBHAN P FOR BEST PAPER PRESENTATION AWARD

A paper titled **"Satellite Constellation Design through Exhaustive Search"** by **Shri. Parthibhan. P** has received ***"Best Research Paper Presentation Award"*** at International Conference on Recent Challenges in Engineering and Technology (ICRCET-18) held at Pune, during 2nd-3rd April 2018. This paper is co-authored by Deva Arul Daniel.

AIT FACILITY-2 AT ISITE

The ISRO Satellite Integration & Test Establishment (ISITE), an extension of U. R. Rao Satellite Centre (URSC) was conceived in the year 2000 as a facility to augment the satellite building capacity of the Centre. This facility is about 7 kilometers away from URSC, Bangalore which is replete with all facilities for rolling out a satellite right from the elemental / subsystems stage to Assembly, Integration and Testing (AIT) of satellites – all in one campus making it unique and only one of its kind in the world. As of now, all of ISRO's high power communication satellites, navigation and meteorological satellites are built and tested here.

ISITE has two clean rooms, one in AITF-1 Complex and the other in AITF-2 Complex, in the space park. The AIT Facility-2 was inaugurated by Shri. A.S.Kiran Kumar, the then Chairman, ISRO in the presence of Dr. M. Annadurai, Director, ISAC on Friday, October 27, 2017. AITF-2 is well connected with roads to other test facilities within ISITE, for transportation of hardware or for testing of spacecraft during various phases of realization.

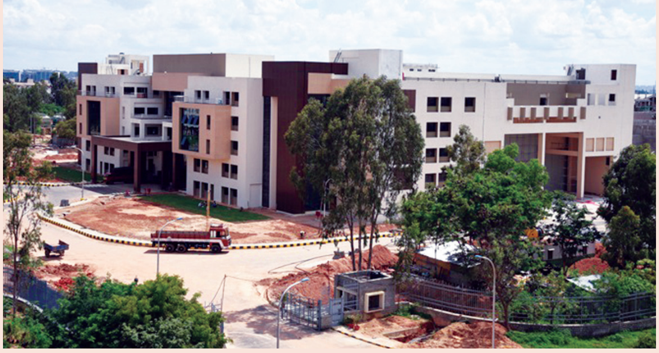


Fig.1: Assembly, Integration & Test Facility-2, ISITE

The clean room in AITF-2 is of 1,00,000 class category and meets federal standard 209E specification, with about 1850 square meter working area. This is almost identical to that in AITF-1. The clean room is provided with change room, air shower, ESD flooring, lighting, overhead EOT crane of 20 tons capacity, compressed air supply, GN2 supply, dedicated seismic platform for CG & MI measurements, zero G fixture, mass parameter measuring machines etc. The two clean rooms support AIT of spacecraft up to 6 ton class and together enable realization of 8 spacecraft simultaneously.

The ground check out facility in AITF-2 is attached to the clean room and consists of 4 well equipped checkout labs which can cater to all the necessary satellite checkouts and testing. The checkout labs are fitted with modular furniture, underground tunnel connecting to clean room and other facilities for laying of DC and RF cables. All the 4 labs are well laid out and equipped with state of the art computers, checkout racks housing equipments required for testing GEO, Navigation and meteorological satellites. CHECNET interlinks these labs with other facilities for remote testing of satellites. Computer tables, storage cup-boards and video wall monitors are available in all the 4 labs.

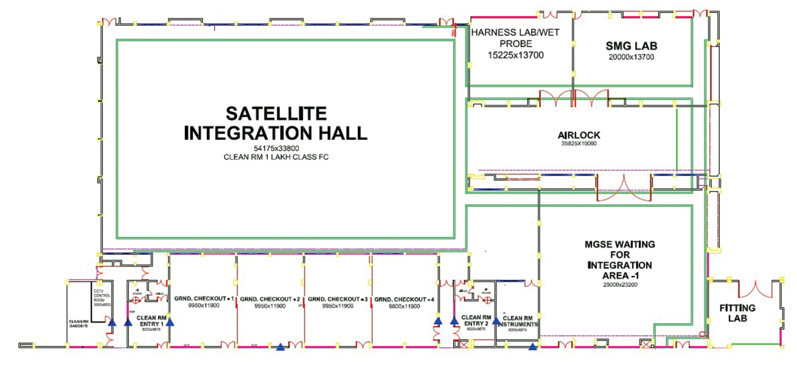


Fig.2: Layout Plan of AITF-2, ISITE

Dedicated air lock area, for loading and unloading of spacecraft hardware / spacecraft, with 20 ton crane is connected to the clean room. Harness fabrication Lab is built next to the clean room where spacecraft harness can be fabricated and delivered to clean room. Preparation of critical solar panels and reflector sub assemblies can be made in the attached Mechanisms Lab. Zero-G facility is built inside the clean room for solar panel deployment activity on spacecraft. AITF-2 is also provided with a MGSE storage area, next to the clean room.

AITF-2 in the space park is ideally suitable for spacecraft realization by external vendors. The Space Park spread across 25 acres of area within ISITE, houses all the facilities for satellite building and testing by the Industry partners in order to enhance the capacity of satellite building. The space park also houses High Density Interconnect (HDI) facility, Solar panel and battery labs along with required services. The High Density Interconnect Facility is aimed at realizing space grade PCBs with fine line and fine spacing. IRNSS-1I, a vendor realized satellite was the first one to be rolled out from AITF-2 in March 2018.

Shri. P.K.Poddar, *Manager, ISITE Cleanrooms, SIG*
Dr. V.K.Hariharan, *DD, ICA*

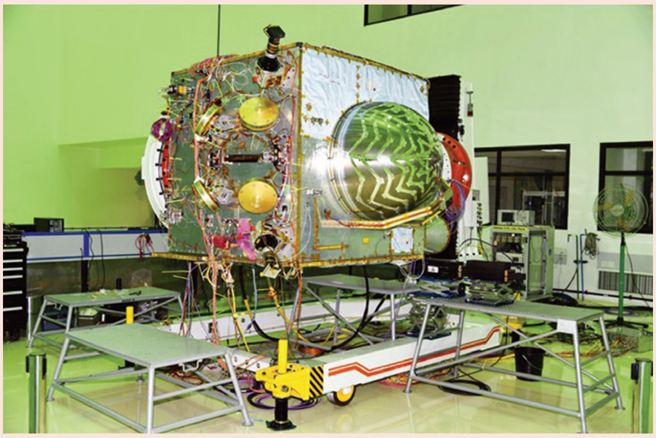


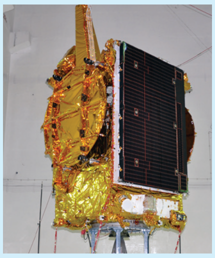
Fig.3: IRNSS-1I, first satellite realized at AITF-2, ISITE

RESOURCESAT-2 COMPLETES SEVEN YEARS IN ORBIT ON APRIL 20, 2018

RESOURCESAT-2 is intended to continue the remote sensing data services globally and provide data with enhanced multispectral and spatial coverage as well. It carried four payloads viz., Linear Imaging Scanning Sensor (LISS)-3, Linear Imaging Scanning Sensor (LISS)-4, Advanced Wide field Sensor (AWiFS)- A & B and hosted Indian Payload for Automatic Identification of Ships (AIS) onboard. All the payloads are functioning satisfactorily. It is offering images which have an excellent combination of large area coverage, frequent revisit and multispectral capabilities providing plentiful applications in the area of land and water resource management.

GSAT-19 COMPLETES ONE YEAR IN ORBIT ON JUNE 05, 2018

GSAT-19 carried Ka/Ku-band high throughput communication transponders and a Geostationary Radiation Spectrometer (GRASP) payload to monitor and study the nature of charged particles and the influence of space radiation on satellites and their electronic components. It also features certain advanced spacecraft technologies including miniaturised heat pipe, fibre optic gyro, Micro Electro-Mechanical Systems (MEMS) accelerometer, Ku-band TTC transponder, as well as an indigenous lithium-ion battery. The performance of all the experimental subsystems and payloads is up to the mark and satellite is functioning satisfactorily in orbit.

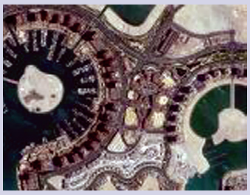


CARTOSAT-2C COMPLETES TWO YEARS IN ORBIT ON JUNE 22, 2018

CARTOSAT-2C is an advanced remote sensing satellite which carried a panchromatic camera, four-band multispectral camera operating in time delay integration mode and event monitoring camera which can provide video imageries of preselected sites. All the systems performance is normal and the users are satisfied with the services offered by this spacecraft.

CARTOSAT-2E COMPLETES ONE YEAR IN ORBIT ON JUNE 23, 2018

CARTOSAT-2E is an advanced remote sensing satellite which carries a panchromatic camera, four-band multispectral camera operating in time delay integration mode and event monitoring camera which can provide video imageries of preselected sites. This satellite has been built with all the new technologies of Cartosat-2C. In addition, the operation of indigenously developed CFRP payload structure, indigenous thruster bed heater and in-house satellite positioning system have been successfully demonstrated.



GSAT-17 COMPLETES ONE YEAR IN ORBIT ON JUNE 29, 2018

GSAT-17 carries Payloads in Normal C-band, Extended C-band and S-band to provide various communication services. It also carried equipment for meteorological data relay and satellite based search and rescue services being provided by earlier INSAT satellites. It was designed to provide continuity of services on operational satellites in C-band, Extended C-band and S-bands. It was launched into a Geosynchronous Transfer Orbit (GTO) by Ariane-5 VA-238 launch vehicle. The spacecraft is providing intended services flawlessly.

AN EVENT NOT TO BE MISSED

Heaven sent: Meteor showers

As Earth glides through the trail left behind by comet swift-tuttle, be ready for a brilliant display of sparkle in the sky. While the perseids meteor shower happens every year, this year the peak falls on a new Moon day , perfect background for the show!

Swift-tuttle is periodic comet visiting us every 133 years and one of the largest of its kind. With observational records as early as 322 BC, it has a well determined orbit. It has always been seen as a threat to collision with Earth but not until atleast for another 2000 years according to recent calculations (which are hopefully correct!).

Perseids meteor showers occur as Earth passes through the dust and debris of comet swift-tuttle and burn them up into tiny fireballs. ***Head out to the outskirts of Bengaluru on the weekend of 10-12 August 2018 and enjoy the show!***

(News source: World Wide Web)

TECHNOLOGY

Motto of Life

Day or night always remember motto of life,
Do your best if you have to awaken whole night,
Take all advice but always apply own mind,
Never keep aside, the goal set right,
Day or night always..........

Heart not to be broken, if results are not right,
Patience & practice to always keep in mind,
Keep the goals always in front of your eyes,
Master the art, keep always trying,
Day or night always.........

Perfection is what always to be tried,
Do the things always on time,
Study & play make combination right,
Never lose hope as God is always at your side,
Elders to be obeyed to make spirit high,
Stand with truth using full might,
Day or night always.....

Only study will not make us bright,
Learn from mistakes & aim high,
Increase the bar after attaining the height,
Do your duty faithfully & keep head high,
Pull your socks & keep sorrow aside,
Day or night always.......

Dr Kamaljeet Singh, *SEG/ISAC*

Exploring Space

space is full of unknown mysteries

unexplored planets unexplored territories

or maybe even unknown species

which can overtake us and wipe out our
histories

spacecraft give us eyes

to gain even some knowledge with numerous tries

we gain insight about weather,tides and our
hearth

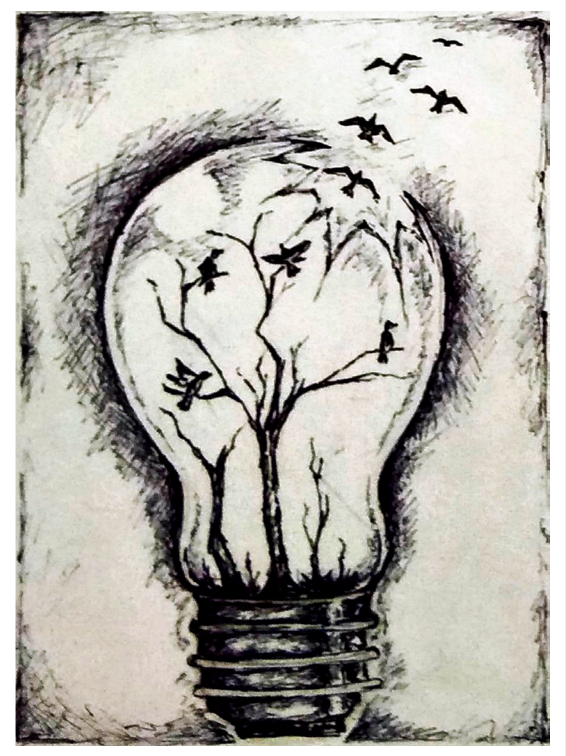
which is none other than our mother earth

this mystery called space will demsytify

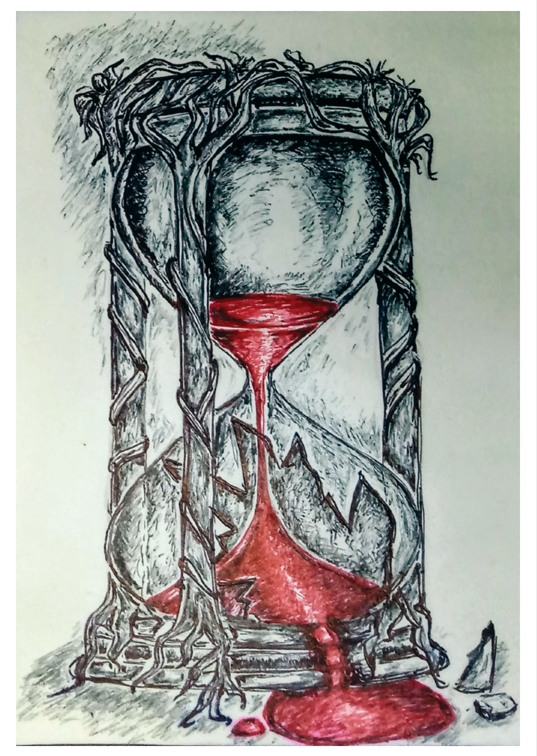
only when we assure that our
satellites fly

Shivangi Jha, *SCI./ENG.-SC, RQA*

Freedom: Only thing that allows us to be ourselves



Running out of time: Lets fulfil the pending dreams before its too late



Ankita Sinha, *SCI./ENG.-SC, SPA*

STRUCTURED TRAINING PROGRAMME

U. R. Rao Satellite Centre (URSC), organized Structured Training Programme on "Technology Management for Indian Space Programme-Technology forecasting, development, transfers and IPR" during 20-25 May 2018 at ISRO Guest House, Devanahalli.

संरचनाबद्ध प्रशिक्षण कार्यक्रम (एस.टी.पी.)
"भारतीय अंतरिक्ष कार्यक्रम हेतु प्रौद्योगिकी प्रबंधन-पूर्वानुमान,विकास,स्थानांतरण व आई.पी.आर."
STRUCTURED TRAINING PROGRAMME (STP)
"Technology Management for Indian Space Programme-Forecasting, Development, Transfer and IPR"
20 - 25 May, 2018
यू.आर. राव उपग्रह केंद्र, बेंगलूरु
U R RAO SATELLITE CENTRE, BENGALURU

ISRO being an R&D establishment is engaged in cutting edge space related technology development programmes to keep abreast with the International trends in various domains. To facilitate greater participation of Indian Industries and commercial exploitations, ISRO has well laid down technology transfer policy.

In this direction, the objective of the programme was to provide an in-depth understanding on technology management concepts such as technology strategy, technology forecasting, technology roadmaps, and technology project portfolios. The course comprised of technical sessions, invited talks, industry visits and case studies.

Introductory remarks on the programme were given by Dr M. Annadurai, Director, URSC. **The inaugural guest lecture was delivered by Dr K. Sivan, Chairman, ISRO who emphasized the importance of Technology Management in his highly informative session.** Some of the eminent speakers included Prof K. B Akhilesh, IISc Bengaluru, Shri Hari Varrier, Director Enzen Global (Global energy & environment MNC), Shri Rakesh Sasibhushan, CMD Antrix, Dr Anand Badigannavar, BARC, Dr Angshuman Ghosh Lead Data Scientist-Target Corporation, Shri Subramania Venkat Pillai, Director-Baker Tilly International, Dr V. K Dadhwal, Director-IIST, Dr T. Ramakrishna, NLSIU, Shri Surinder Singh, Director SCL, Shri V V Srinivasan, Director ISTRAC.

There were 35 participants who were employees from IPRC, SAC, SCL, LEOS, SDSC-SHAR, LPSC, URSC, PRL, VSSC, NRSC, IISU, MCF, ISTRAC, NARL & ADRIN. Six themes were identified by the organizing committee which were used for Brainstorming & Project presentation by the participants. The programme also comprised of Briefing about ISITE & ISITE Facility Visit, Space Quiz, Team building sessions & a Humour based talk to keep the audience engaged and reduce the monotony.

Navaneetha Krishnan S, *PPEG*

SPECIALIZED STRUCTURED TRAINING PROGRAMME MECHANICAL (SSTP- M)

Based on the approved HRDD Training calendar for 2018, HRDD/PPEG organized a six days residential **Specialized Structured Training Programme – Mechanical (SSTP-M) during 14-20 June 2018** for middle level engineers from core Groups related to Mechanical activities of URSC.

The objective of the programme was to develop good system engineers in mechanical field and create awareness about their domain and related peripheral activities for better understanding & effective execution of their assigned tasks. The above training programme was conducted at ISRO Guest House, Devanahalli.

The inaugural guest lecture was delivered by Dr Rahul M Cadambi, Associate Professor Ramaiah University on the topic **"Nanotechnology in Space Applications".** The speakers identified for the training programme were from different Centres such as URSC, VSSC, IISU, LPSC, LEOS & SAC. There were 24 participants from various Centres such as URSC, LPSC & MCF. The programme also comprised of industry visit for the first time to Tata Advanced Materials Limited (TAML) Jigani, Team Building Activity & Visit to Nandi Grama & Muddenahalli to reduce the monotony and keep a charged up atmosphere. The programme concluded with a 1-hour test comprising of questions set by the various speakers to assess the learning levels.

Navaneetha Krishnan S, *PPEG*

EVENTS & VISITS

127th Brith Anniversary Celebration of Bharat Ratna Dr B R Ambedkar

Address by Chairman ISRO on 5th April 2018

CISF Mock Drill at URSC Guest House

Inauguration of Bhaskara Video Conference Hall by Chairman ISRO

Fire Safety Mock Drill at ISITE

Inauguration of MSA Building by Chairman ISRO

Inauguration of MSA Building by Chairman ISRO

Inauguration of new AHU for ISAC cleanroom

Induction Training Programme at ISRO Guest House Devanahalli

Induction Training Programme for Assistants

Seminar on Ultralight Structures for the Space Solar Power Project

Managerial Skill Development Programme for Admin Ofiicers

Managerial Skill Development Programme for Scientist / Engineer SEs

इसरो प्रवेश प्रशिक्षण कार्यक्रम–(आई.आई.टी.पी.-30)
“क्षेत्र विशिष्ट गहन माड्यूल”
ISRO INDUCTION TRAINING PROGRAMME (IITP- 30)
A SPECIFIC INTENSIVE MODULE (ASIM)”
इसरो उपग्रह केंद्र, बेंगलूरु
ISRO SATELLITE CENTRE, BENGALURU

ISRO Induction Training Programme

Staying Alive as a Leader-Distinguished lecture by HR Direct

Specialized short course on Modern Infrared Image Processing

Mandatory Training Programme

EVENTS & VISITS

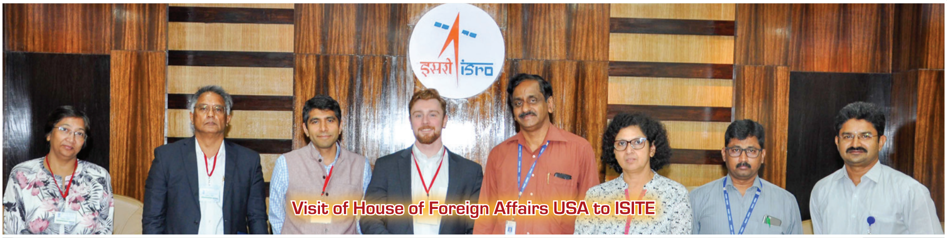
Swachh Bharath Mission at Gunjur Govt. School

Visit & Address by Chairman, ISRO on 2-6-18

Visit of Director- LPSC to ISITE

Spacecraft Alignment Outsourcing
Pre EoI Conference

Visit of Director General of Audit,
Scientific Departments

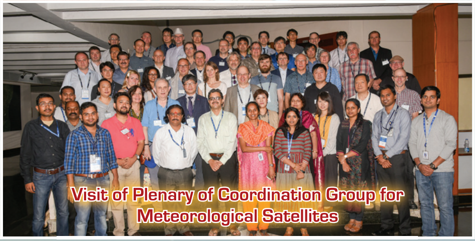

Visit of House of Foreign Affairs USA to ISITE

Visit of French Delegation to ISITE

Visit of Member of Finance

Visit of Arianespace Delegation to ISITE

Visit of IG CISF Officer to URSC


Visit of Plenary of Coordination Group for
Meteorological Satellites

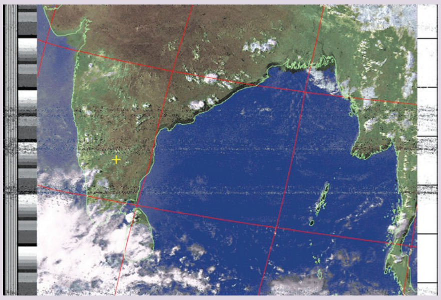
WORLD AMATEUR RADIO DAY ON APRIL 18, 2018

World Amateur Radio Day is celebrated every year on April 18th to commemorate formation of International Amateur Radio Union in Paris. In this connection, a one day workshop on the theme 'Ham Radio & Amateur Space Communication' was conducted in URSC on April 18, 2018 in order to showcase the importance of Ham Radio and its present day relevance to the Small Satellite Programmes.

The event was inaugurated by Dr M Annadurai, Director URSC, in a unique way by initiating the live transmission of a Morse Code message through one of the popular software used by Hams (Amateur Radio Operators), and subsequently chatting live with a Ham located in south of Bengaluru using the Ham Radio equipment. He has highlighted the uniqueness of the Amateur Radio hobby where in people of different technical interests can pursue the field of their liking, irrespective of their professional job area. He urged the young employees of URSC to pursue their varied interests through the hobby of Ham Radio and realize another Ham Satellite in URSC, for which the centre can extend all support.

As part of the event, Director URSC and several personalities related to Ham Radio, viz. some key members of ISRO's HAMSAT-1 satellite team, Bengaluru based Ham Institutes & the founding members of Upagrah Amateur Radio Club (UPARC) of URSC, were honoured with special mementos, and they subsequently shared the experiences of their journey into the exciting field of Ham Radio.

The workshop introduced various facets of Amateur Radio through lecture, presentations and live demonstrations by the members of UPARC. The audience were provided with glimpses of the importance given to Ham Radio by various space agencies in the world and also the Amateur Radio Satellites being built by several other institutes. They were also introduced to the basics of long distance communication and some of the innovative techniques and gadgets used by Hams.



Part of the workshop, which had the audience's rapt attention were the 'live' demonstrations using the gadgets and software which are available either freely or at a nominal cost. One such demo is the 'live' reception of a weather picture over India from one of the NOAA weather satellite using these inexpensive Ham gadgets. In another demo, audience were introduced to a satellite tracking software using a mobile phone, using which the position/ location/ path of any orbiting satellite can be seen.

Other than the technical aspects, the audiences were also provided a peek into the Societal Services of the Hams, especially during natural calamities, and the Fun part of Ham Radio like Fox Hunt - alias - Radio Direction Finding sport and various Contests, Awards & Honors.

Overall, the participants had a good exposure to the Amateur Radio field & hobby, and the workshop induced certain enthusiasm in many of them, which was reflected in their positive feedback after the workshop.

V Raju Sagi & **B A Subramani,** *UPARC*

NATIONAL FIRE SERVICE WEEK VALEDICTORY ON MAY 29, 2018

The Fire Service Week is observed nationwide under the guidance of the Fire Advisor, Ministry of Home Affairs, Government of India during April 14 every year. This is in remembrance of the lives lost in the devastating fire that erupted and the explosion that followed on 14th April 1944 at the Victoria Dock in the Bombay post and also to prevent fire hazards in all industries. The National Safety Council (NSC) has been promoting fire week campaign since 1999 with a view to propagate fire safety awareness.

The Fire Service Week was observed in URSC for the first time this year, with a view to promote awareness among employees about Fire Safety. Various competitions like Essay Writing competition (in three languages), Poster making competition and Slogan writing (in three languages) were organized as part of the observance. An emergency fire evacuation mock drill of AIT-1 Block at ISITE was also conducted on 18th April, 2018.

The valedictory of FSW-2018 was held on 29th May 2018. Dr. A. K. Sharma, Controller, URSC/DD, MISA appreciated the idea of FSW observation and said that these activities go a long way in re-enforcing the idea of safety in the minds of the people. Shri. G N V Prasad, DD/MISA also spoke on the occasion and highlighted the various activities of STDD. **Shri. Mallikarjuna Y B, Sr. Manager (Fire & Safety), HAL, Bengaluru,** gave a brief presentation on various aspects of "Fire Safety". He also gave away prizes to the winners of the various competitions.

Mohamed Nagoor Meeran M, *Safety Engineer, STDD/ PPEG/ MISA*

SATELLITE TECHNOLOGY DAY ON APRIL 19, 2018

Satellite Technology Day (STD) celebrated at U. R. Rao Satellite Centre (URSC), commemorating the launch anniversary of India's first satellite "Aryabhata" gives a forum to present and discuss some of the technologies developed in the recent past.

The technical session started with "Aryabhata" Lecture which was delivered by **Distinguished Professor, Dr. T. K. Alex (Former Director, URSC) on "Advances in Optical Communication".**

TECHNICAL PAPER PRESENTATIONS:

Papers on various spacecraft technologies were received from all ISRO centers. Papers stressing on novelty and belonging to the following categories were invited, namely new design concepts, theoretical modeling and analysis, demonstrated results on-orbit and/or on ground, new process / product development and applications, new materials and their scope in spacecraft systems, new methods of test, evaluation & characterization, spacecraft ground systems development and standardization of spacecraft systems for production and automation.

There was a highly enthusiastic response from the ISRO community to this call and sixty papers were received. Rigorous evaluations of the papers were carried out by meticulously selected domain experts. Six outstanding papers were selected for presentation during the Satellite Technology Day–2018 symposium. The selected papers brought out the designs and developments being realized in different areas of spacecraft technology. The Proceedings of STD-2018 which includes the abstract of the "Aryabhata" lecture and extended abstracts of all the six selected papers were released.

SPARK - PLATFORM FOR INNOVATIVE IDEAS

The main motivation of conducting SPARK is to provide a platform for the young engineers, to come forward and enlighten the satellite community about what they envision as the future of Satellite Technology & Applications. SPARK is especially programmed for young minds to come out with innovative ideas and research proposals that can be developed for future use in the areas of satellite technology, applications and explorations etc.

Considering the short time, the response to SPARK was excellent. The ideas submitted were interesting, ranging from proven to fantasy, but on the whole, thought provoking. The proposals showed the sincere efforts put by youngsters. Nineteen proposals were received from various fields of satellite technology, applications & explorations. Another interesting aspect was that the authors did not restrict themselves to their field of work in ISRO but spread their thinking wings beyond.

Concept, originality and feasibility of the idea were the factors considered by the reviewers chosen from relevant fields. Based on the feedback from the reviewers, four abstracts were selected for final presentation.

STUDENT PAPERS:

As several academic institutions are involved in spacecraft related works, it was thought that it would be appropriate to have a session where the students present the papers related to satellite technologies and for the first time this session was introduced during STD-2018.

The response to Student papers was excellent. The topics were innovative and many new proposals and ideas were put across by young students from various colleges. The proposals showed the sincere efforts put by youngsters. Forty three proposals were received covering all fields of satellite technology and applications. Based on criteria detailed in the call letter, importance was given to the concept, originality and feasibility. Reviewers were chosen from relevant fields and based on the feedback from reviewers, four abstracts were chosen for final presentation.

With the Aryabhata lecture, presentation of the technical papers, presentation of student papers and SPARK, it was a full day event at URSC.

Organisingcommittee, STD 2018

CONFERENCE ON SOUTH ASIAN SATELLITE (CSAS-2018) ON JUNE 13, 2018

05th May 2017 was indeed a memorable day to all the countrymen and to ISRO in particular. It was on this day GSAT-9 satellite took its flight onboard GSLV MK II F-09 flight to its designated orbit for rendering communication services to SAARC countries. This mission was also unique because it carried Electric Propulsion System (EPS) for the first time in orbit. **To commemorate the successful demonstration of this technology for a period of one year in orbit, URSC organised a one day Conference on South Asian Satellite-CSAS 2018 on the 13th of June 2018.**

Delegates from all ISRO Centres, University students and special invitees were welcomed by the chairman of the organizing committee. Shri. Kiran Kumar, Ex-Chairman, ISRO and Director URSC delivered the key note address and the presidential address respectively.

This conference aimed at sharing the developmental challenges and in-orbit operational experience with EPS. It also provided exposure to the innovations in satellite propulsion systems for futuristic missions. The conference was held in two sessions. The first session focused on the developmental challenges for EPS inclusion, performance in orbit and the lessons learnt thereof. The second session was based on the innovations in the field of Propulsion for the next generation satellites. Two plenary talks were delivered, one each by Professor R.V. Ramanan from IIST Thiruvananthapuram and Dr. Shashank Chaturvedi, Director, Institute for Plasma Research (IPR). These talks laid emphasis on low thrust propulsion systems and their applications. Papers in the related field were invited from all ISRO Centres, IISC, IITs, IIST and Indian institutions making nano satellites. The papers were reviewed by the editorial committee and selected papers were presented on the day of conference in the second session. A souvenir comprising of all the received papers was also released.

The in-orbit experience gained from GSAT-9 EPS operations has paved the way for future developments which are being carried out. This conference has provided an insight to the recent developments in the field of satellite propulsion which shall be very useful in the making of nano satellites.

Farhana Tabassum, *Member Secretary, CSAS-2018*

GRANDSLAM CRICKET 2018 ON MAY 29, 2018

Grandslam Cricket 2018 – Inter-group Cricket Tournament was organized by **URSC Welfare Association (UWA)/URSC Sports Council (USC).** The tournament was conducted on league cum knockout basis (total of 47 matches), with 20 teams (more than 300 employees of URSC, who are members of Welfare association) participating in this mega event. The tournament was conducted using tennis ball. The grand finale of the tournament was held on **29th May 2018 at K.V NAL School, between PROJECTS and SEG teams.** PROJECTS team won a nail biting final match to win the championship. Both the inaugural match and the final presentation ceremony, was graced by the presence of Director, URSC.

A.V. Nirmal,
Group Director, SEG.

INTERNATIONAL YOGA DAY CELEBRATIONS ON JUNE 21, 2018

While addressing the 69th session of United Nations General Assembly (UNGA) on September 27, 2014, the Honorable Prime Minister of India Shri Narendra Modi urged the world community to adopt an International Day of Yoga. On December 11, 2014, the 193 member UNGA approved the proposal by consensus with a record 177 co-sponsoring countries a resolution to establish **21st June as "International Day of Yoga".** In its resolution, the UNGA recognised that Yoga provides a holistic approach to health and well-being and wider dissemination of information about the benefits of practicing Yoga for the health of the world population. Yoga also brings harmony in all walks of life and thus, is known for disease prevention, health promotion and management of many lifestyle related disorders.

Every year URSC celebrates International day of yoga with a host of events that creates awareness, interest and opportunities to practice yoga among the employees. Fourth International day of yoga is also celebrated with all the varied dimensions of yoga spanning a fortnight. Regular yoga sessions with asanas, pranayam and meditation are organized for a week which was conducted by QCI certified level-2 yoga teachers from Art of Living, Bengaluru. Various competitions like asana demonstration, surya namaskar challenge and yoga quiz were organized which saw an enthusiastic participation from the employees.

The celebration on June 21st started with more than 300 employees of URSC attending "Common Yoga Protocol (CYP)" lead by Sri. Aravind Mishra (Sri Sri School of Yoga, Bengaluru). The event was attended by many senior dignitaries of URSC like Dr. Anand Kumar Sharma, Controller, URSC, Dr.Venkateswara Sharma S, Deputy Director, SPA, URSC and Shri. Manohar L Vanniar, Sr. Head P&GA, URSC.

It was followed by a Yoga seminar by Sri. Manas Maral (Founder of Sushrut Yog Research Centre, Bengaluru) on the topic of **"Therapeutic yoga".** His talk about alternate medicine and useful yoga practices for physical health and mental peace was received well by an audience of more than 200 employees. In the prize distribution ceremony lead by Chief Guest, employees were honoured with certificates for winning the various events organized as part of yoga week celebrations.

The cultural event was based on theme of **"ashtanga yoga (eight limbs of yoga)"** performed by the students of Sri Sri College of Ayurveda, Bengaluru. It was a fusion of various dance forms, vocal renditions expressing the in expressible bliss that can be achieved by the disciplined practice of yoga. The cultural event concluded with the demonstration of intuitive abilities of some gifted children who are practicing a specialized technique of meditation called "Pranja Yoga".

A meditation program called "APEX Sahaj" from Art of Living for 25 senior management members was also conducted from June 25th to 27th. This is a popular program among many corporates, known to improve the intuition, innovation and right decision making abilities among the practitioners.

Convenor, *International Yoga Day Celebrations – 2018*

ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಪ್ರತಿಫಲಕ

ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಪ್ರತಿಫಲಕವು ದೂರ ಸಂವೇದಿ ಹಾಗೂ ಸಂಪರ್ಕ ಉಪಗ್ರಹಗಳಲ್ಲಿ ಬಳಸಲಾಗುವ ದೊಡ್ಡದಾದ ಪ್ರತಿಫಲಕ. ೬ ಮೀಟರ್ ಹಾಗು ಅದಕ್ಕಿಂತ ಹೆಚ್ಚಿನ ವ್ಯಾಸದ ಇಂತಹ ಆಂಟೆನ ಪ್ರತಿಫಲಕವನ್ನು ಜಗತ್ತಿನಲ್ಲಿ ಇದುವರೆಗೆ ಅಮೇರಿಕ ಮತ್ತು ಜಪಾನ್ ಮಾತ್ರ ಅಭಿವೃದ್ಧಿಪಡಿಸಲು ಸಾಧ್ಯವಾಗಿತ್ತು. ಭಾರತವು GSAT-6 ರ ಉಡಾವಣೆಯೊಂದಿಗೆ ಈ ಸಾಧನೆಗೈದ ಮೂರನೆ ರಾಷ್ಟ್ರವಾಯಿತು. ಇಂದಿನವರೆಗೆ ೪ ಮೀಟರಿನಿಂದ ೨೧ ಮೀಟರಿನ ತನಕದ ವ್ಯಾಸವುಳ್ಳ ಆಂಟೆನ ಪ್ರತಿಫಲಕಗಳನ್ನು ಉಪಗ್ರಹಗಳಲ್ಲಿ ಅಳವಡಿಸಿ ಬಾಹ್ಯಾಕಾಶಕ್ಕೆ ಉಡಾಯಿಸಲಾಗಿದೆ. ಹಾರಿಸ್ ೪.೮ ಮೀಟರ್ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ನಾಸಾದ ಟ್ರಾಕಿಂಗ್ ಹಾಗು ದತ್ತಾಂಶ ರಿಲೆ ಉಪಗ್ರಹದಲ್ಲಿ ಯಶಸ್ವಿಯಾಗಿ ಕಾರ್ಯನಿರ್ವಹಿಸಿ S–ಬ್ಯಾಂಡ್, K–ಬ್ಯಾಂಡ್ ಹಾಗೂ X–ಬ್ಯಾಂಡ್ ಆವರ್ತಾಂಕದಲ್ಲಿ ದತ್ತಾಂಶ ರವಾನೆ ಮಾಡಿತ್ತು.

ಭಾರತವು ಈ ಕ್ಲಿಷ್ಟಕರವಾದ ತಂತ್ರಜ್ಞಾನವನ್ನು ಆಮೂಲಾಗ್ರವಾಗಿ ಅಭಿವೃದ್ಧಿಪಡಿಸಿ, ಪ್ರಥಮ ಬಾರಿಗೆ ೬ ಮೀಟರ್ ವ್ಯಾಸದ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನಾವನ್ನು GSAT-6 ಉಪಗ್ರಹದಲ್ಲಿ ಯಶಸ್ವಿಯಾಗಿ ಉಡಾಯಿಸಿತು. ಅನ್‌ಫರ್ಲೆಬಲ್ ಎಂದರೆ ಕೊಡೆಯಂತೆ ಮಡಚುವ ಹಾಗೂ ಬಿಚ್ಚಿಕೊಳ್ಳುವ ಸಾಮರ್ಥ್ಯವುಳ್ಳ ಯಂತ್ರಾವಳಿಯನ್ನು ಅಳವಡಿಸಿದಂತಹುದು. ಇದಕ್ಕಾಗಿ, ಆಂಟೆನಾಗೆ ಪಾರಬೊಲಾ ಆಕೃತಿಯನ್ನು ನೀಡಲು ಅನೇಕ ತಂತ್ರಗಾರಿಕೆಗಳ ಅಗತ್ಯವಿದೆ. ಈ ಪ್ರತಿಫಲಕಗಳು ರೇಡಿಯೋ ತರಂಗಗಳನ್ನು ಪ್ರತಿಫಲಿಸುವ ಕ್ಷಮತೆಯನ್ನು ಹೊಂದಿರಬೇಕಲ್ಲದೆ, ಬಾಹ್ಯಾಕಾಶದ ಕ್ಲಿಷ್ಟ ವಾತಾವರಣವನ್ನು ಸಮರ್ಥವಾಗಿ ಎದುರಿಸಿ ಕಾರ್ಯನಿರ್ವಹಿಸಬೇಕಾಗುತ್ತದೆ. ಪ್ರಸ್ತುತ ಪ್ರತಿಫಲಕವನ್ನು ಬಲೆಯಂತೆ ಹೆಣೆದು ಅದರ ಪ್ರತಿಫಲನ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೆಚ್ಚಿಸಲು ಚಿನ್ನದ ಲೇಪನ ನೀಡಲಾಗಿದೆ. ಉಪಗ್ರಹ ಯಂತ್ರಾವಳಿ ಸಮೂಹ ಈ ಆಂಟೆನಾವನ್ನು ವಿನ್ಯಾಸ ಮಾಡಿ ಎಲ್ಲಾ ರೀತಿಯ ಭೂ ಪರೀಕ್ಷೆಗಳನ್ನು ಯಶಸ್ವಿಯಾಗಿ ಪೂರೈಸಿ GSAT-6 ಉಪಗ್ರಹದಲ್ಲಿ ಸಮಾಕಲಿಸಿದ ನಂತರ ಆಗಸ್ಟ್ ೨೭, ೨೦೧೫ ರಂದು ಜಿ.ಎಸ್.ಎಲ್.ವಿ ರಾಕೆಟ್ಟಿನಲ್ಲಿ ಉಡಾಯಿಸಲಾಯಿತು. ಉಪಗ್ರಹವು ನಿರ್ಧರಿತ ಕಕ್ಷೆಯನ್ನು ಸೇರಿದನಂತರ, ಅಂಟೆನಾ ಪ್ರತಿಫಲಕವನ್ನು ಪೂರ್ಣ ಗಾತ್ರಕ್ಕೆ ಬಿಡಿಸಿ ಕಕ್ಷೆಯಲ್ಲಿ ನಡೆಸಿದ ವಿವಿಧ ಪರೀಕ್ಷೆಗಳ ಮೂಲಕ ಸಂಪರ್ಕ ಸಂಕೇತಗಳನ್ನು ಸಮರ್ಪಕವಾಗಿ ಭೂಮಿಗೆ ರವಾನೆ ಮಾಡಿ ಇದರ ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಸಾಬೀತುಪಡಿಸಲಾಯಿತು.

ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಅಭಿವೃದ್ಧಿಯ ಸವಾಲುಗಳು:

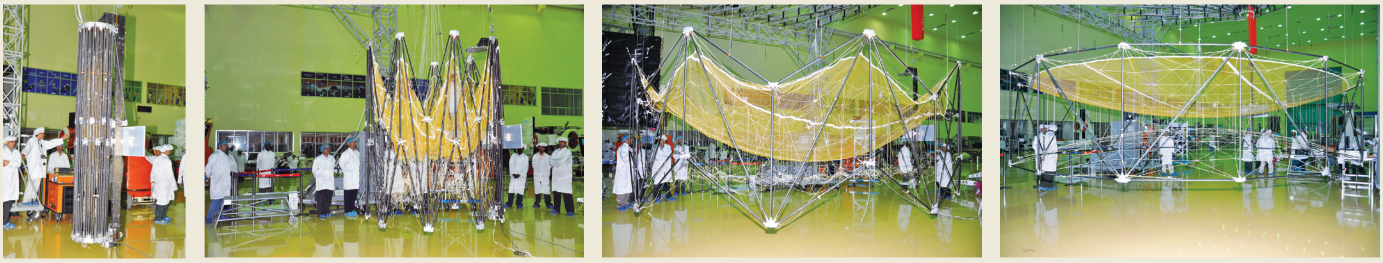
ಇಲ್ಲಿರುವ ಸವಾಲಿನ ವಿಚಾರವೆಂದರೆ ನಿಖರ ಆಕೃತಿ ಹಾಗೂ ಮೇಲ್ಮೈ ಸ್ವರೂಪವನ್ನು ಕಕ್ಷೆಯಲ್ಲಿನ ಪ್ರಖರ ವಾತಾವರಣದಲ್ಲಿ ಬದಲಾಗದಂತೆ ಕಾಯ್ದುಕೊಳ್ಳುವುದು. ಅದಲ್ಲದೆ, ಸಣ್ಣ ಗಾತ್ರದಲ್ಲಿ ಮಡಚಿ ರಾಕೆಟ್‌ನಲ್ಲಿ ಲಭ್ಯವಿರುವ ಸ್ಥಳಾವಕಾಶದಲ್ಲಿ ಉಪಗ್ರಹಕ್ಕೆ ಜೋಡಿಸುವುದು.

ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನದ ಪ್ರಮುಖ ಆಂಶಗಳು

ಹಗುರ ತಂತಿಜಾಲ, ಪರಸ್ಪರ ಜೋಡಿಸ ಟ್ಟಿರುವ ಲಂಬ ಮತ್ತು ವರ್ತುಲ ಕೊಳವೆಗಳು, ಮಡಿಸಲು ಸಾಧ್ಯವಾಗುವಂತಹ ಬೃಹತ್ ಕೊಡೆಯ ರೂಪದ ಯಂತ್ರಾವಳಿ ಈ ಆಂಟೆನಾದ ವೈಶಿಷ್ಟ್ಯ. ಇದರ ಪ್ರಮುಖ ಆಂಶಗಳು:

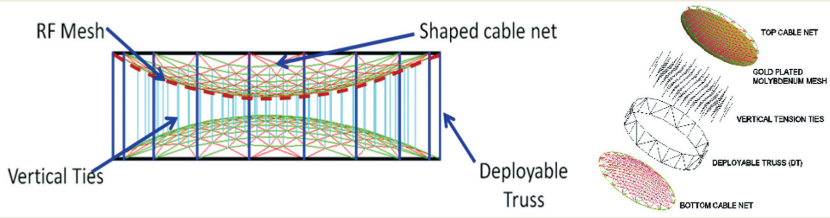
೧. ಹರಡಿಕೊಳ್ಳುವ ಟ್ರಸ್ (Truss) ಯಂತ್ರಾವಳಿ
೨. ಕೇಬಲ್ ಜಾಲ ಹಾಗು ರೆಡಿಯೋ ತರಂಗಬಲೆ (Cable Net and RF Mesh)
೩. ಉಪಗ್ರಹದ ಮೇಲೆ ಆಂಟೆನಾವನ್ನು ಹಿಡಿದಿಡುವ ಹಾಗೂ ಬಿಡಿಸುವ ಯಂತ್ರಾವಳಿಗಳು (Hold down and Release Mechanisms)

GSAT-6 ಉಪಗ್ರಹದಲ್ಲಿ ಉಡಾಯಿಸಲಾದ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಪ್ರತಿಫಲಕವು ೬ ಮೀಟರ್ ವ್ಯಾಸದ 'ಪಾರಬೊಲಾ' ಆಕೃತಿಯ ಸಾಧನ, ಅದನ್ನು ಕೇವಲ ೦.೪ ಮೀಟರ್ ವ್ಯಾಸಕ್ಕೆ ಮಡಸಿಟ್ಟು ಉಪಗ್ರಹದಲ್ಲಿ ಜೋಡಿಸಿ ಉಡಾಯಿಸಲಾಗಿತ್ತು. ೬ ಮೀಟರ್ ವ್ಯಾಸದ ಪ್ರತಿಫಲಕವನ್ನು ೦.೪ ಮೀಟರ್ ವ್ಯಾಸಕ್ಕೆ ಮಡಿಸಲು ವಿಶಿಷ್ಟವಾದ ಯಂತ್ರಾವಳಿಯನ್ನು ವಿನ್ಯಾಸಗೊಳಿಸಿ(ಚಿತ್ರ ೧). ಮಡಿಸಿದ ಟ್ರಸ್ ಯಂತ್ರಾವಳಿಯನ್ನು ಬಿಡಿಸಲು ಡಿ ಸಿ ಮೋಟಾರ್‌ನ ಬಳಕೆ ಮಾಡಲಾಗಿತ್ತು. ಈ ಟ್ರಸ್ ಯಂತ್ರಾವಳಿಯಲ್ಲಿ ಸಿ.ಎಫ್.ಅರ್.ಪಿ (CFRP) ಕೊಳವೆಯನ್ನು ಹಾಗು ಅಲ್ಯುಮಿನಮ್ (Aluminum) ಕೀಲುಗಳನ್ನು ಬಳಸಲಾಗಿದೆ. ಇದನ್ನು ಭೂಸ್ಥಿರ ಕಕ್ಷೆಯಲ್ಲಿ ತನ್ನ ಪೂರ್ಣ ಗಾತ್ರಕ್ಕೆ ಬಿಡಿಸಲಾಯಿತು.



ಚಿತ್ರ ೧: ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ – ಮಡಿಸಿರುವ ಆಂಟೆನ, ಬಿಡಿಸಿರುವ ಆಂಟೆನ (ಬಲಕ್ಕೆ)

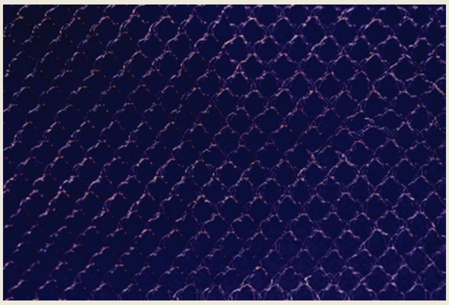
ಚಿತ್ರ : ೨ ರಲ್ಲಿ ತೋರಿಸಿದಂತೆ 'ಪಾರಬೊಲಾ' ಆಕೃತಿಯನ್ನು ಪಡೆಯಲು ಮೇಲಿನ ಮತ್ತು ಕೆಳಗಿನ ಕೇಬಲ್ ಜಾಲವನ್ನು ಪರಸ್ಪರ ಲಂಬವಾಗಿ ವರ್ತುಲ ಕೊಳವೆಗಳ ಮೂಲಕ ಜೋಡಿಸಲಾಗಿತ್ತು. ಈ ಎರಡೂ ಕೇಬಲ್ ಜಾಲವನ್ನು ಬಿಡಿಸಲು ಅಗತ್ಯ ಸೆಳೆತವನ್ನು ಹೊರಬದಿಯಲ್ಲಿರುವ ಯಂತ್ರಾವಳಿಯನ್ನು ಬಳಸಿ, ಮೋಟಾರ್‌ನ ಸಹಾಯದಿಂದ ನೀಡಲಾಗಿತ್ತು. ಇದು ಪೂರ್ಣ ಆಕೃತಿಯನ್ನು ಕಾಯ್ದುಕೊಳ್ಳಲು ಸಹಕಾರಿ. ಕಕ್ಷೆಯ ವಾತಾವರಣದಲ್ಲಿ ಕೇಬಲ್ ಜಾಲದ ನಿಖರತೆಯನ್ನು ಕಾಪಾಡಲು, ಕಾರ್ಬನ್ ಎಳೆಗಳನ್ನು ಬಳಸಲಾಯಿತು.



ಚಿತ್ರ ೨: – ಆಂಟೆನ ಪರಿಕಲ್ಪನೆ

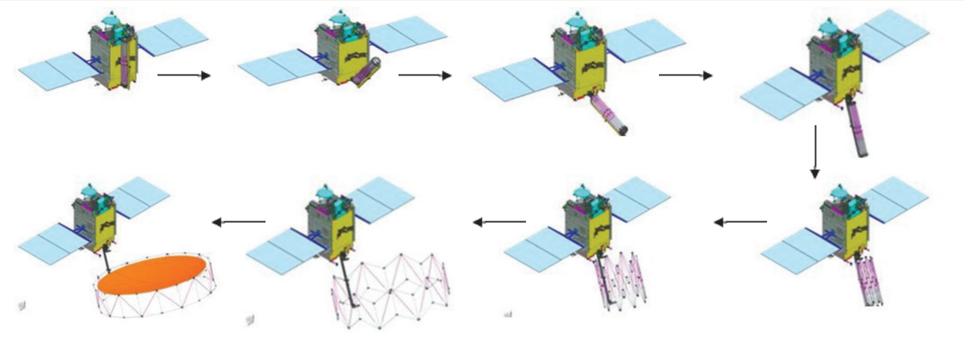
ರೇಡಿಯೋ ತರಂಗಗಳ ಪ್ರತಿಫಲನಾ ಸಾಮರ್ಥ್ಯವನ್ನು ಪಡೆಯಲು ಚಿನ್ನದ ಲೇಪನವುಳ್ಳ ಮೊಲಿಬ್ಡಿನಂ ತರಂಗಬಲೆ ಯನ್ನು ಮೇಲಿನ ಕೇಬಲ್‌ನೆಟ್‌ಗೆ ಜೊಡಿಸಲಾಗಿತ್ತು (ಚಿತ್ರ–೩). ಇದು S–ಬ್ಯಾಂಡ್ ಆವರ್ತಾಂಕದಲ್ಲಿ (~ ೧೦೦ ಮಿಲಿಮೀಟರ್ ತರಂಗಾಂತರ) ಕಾರ್ಯನಿರ್ವಹಿಸಬಲ್ಲುದು. ಇದರ ಮೇಲ್ಮೈ ನಿಖರತೆ ತರಂಗಾಂತರದ ೧/೧೦೦ ರಿಂದ ೧/೨೫ ರಷ್ಟು ಇರಬೇಕು. ಅದಲ್ಲದೆ, ಮೇಲ್ಮೈ ಪದರವು ಸಂಪೂರ್ಣ ಪ್ರತಿಫಲನವನ್ನು ನೀಡಲು ಯೋಗ್ಯವಾಗಿರಬೇಕು. ಈ ಆಂಟೆನಾಗಳು ೩೦ ಗಿಗಾ ಹೆರ್ಟ್ಜ್‌ಗಿಂತ ಕೆಳಗಿನ ಆವರ್ತಾಂಕದ ರೇಡಿಯೋ ತರಂಗಗಳನ್ನು ಹೆಚ್ಚು ಕ್ಷಮತೆಯಿಂದ ರವಾನಿಸಬಲ್ಲವು. ೩೦ ಗಿಗಾ ಹೆರ್ಟ್ಜ್‌ಗಿಂತ ಹೆಚ್ಚಿನ ಆವರ್ತಾಂಕದ ರೇಡಿಯೋ ತರಂಗಗಳನ್ನು ರವಾನಿಸಲು ಇವನ್ನು ಬಳಸಿದರೆ

ತರಂಗಶಕ್ತಿಯಲ್ಲಿ ಕುಂದುಂಟಾಗುತ್ತದೆ. ಆದ್ದರಿಂದ, ಇದಕ್ಕಾಗಿ ಹೆಚ್ಚಿನ ಸಾಂದ್ರತೆಯ ಚಿಕ್ಕ ಕಿಂಡಿಯ ತರಂಗಬಲೆಯನ್ನು ಉಪಯೋಗಿಸಬೇಕಾಗುತ್ತದೆ. ಆದರೆ ಇಂತಹ ಬಲೆಯನ್ನು ತಯಾರಿಸುವುದು ಕಷ್ಟವೇ ಸರಿ.


ಚಿತ್ರ ೩: ಚಿನ್ನದ ಲೇಪದ ಮೊಲಿಬ್ಡಿನಂ ತರಂಗಬಲೆ

ಇಲ್ಲಿ ಗಮನಿಸಬೇಕಾದ ಅಂಶವೆಂದರೆ, ರೇಡಿಯೋ ತರಂಗ ಸ್ವೀಕಾರ ಮತ್ತು ಪ್ರತಿಫಲನ ಈ ಎರಡೂ ಒಂದೇ ಅಂಟೆನಾದಲ್ಲಿ ನಡೆಯುತ್ತದೆ. ಈ ಎಲ್ಲ ಅಗತ್ಯತೆಗಳನ್ನು ಪೂರೈಸಲು ಸೂಕ್ತ ವಸ್ತುಗಳನ್ನು ಬಳಸಿ ಸಮಗ್ರ ವಿನ್ಯಾಸವನ್ನು ಮಾಡಿ ಈ ಆಂಟೆನಾವನ್ನು ತಯಾರಿಸಲಾಯಿತು. ಈ ರೀತಿ ತಯಾರಿಸಿದ ಆಂಟೆನಾದ ತೂಕ ೧೮ ಕಿ. ಗ್ರಾಂ. ಆಗಿದ್ದು ೬ ಮೀಟರ್ ವ್ಯಾಸದ ಕಿಂಡಿಯುಕ್ತ ಪ್ರತಿಫಲಕವನ್ನು ಹೊಂದಿದೆ ಹಾಗು ಇದರ ಸಾಂದ್ರತೆ ಪ್ರತಿ ಚದರ ಮೀಟರ್‌ಗೆ ೦.೫ ಕಿ. ಗ್ರಾಂ.ನಷ್ಟಿರುತ್ತದೆ.

ಉಪಗ್ರಹದ ಉಡಾವಣೆಯ ವೇಳೆಗೆ, ಆಂಟೆನವನ್ನು, ಯಂತ್ರಾವಳಿಯ ಮೂಲಕ ಹಿಡಿದಿಡಲಾಗಿತ್ತು. ಚಿತ್ರ–೪ ರಲ್ಲಿ ತೋರಿಸಿದಂತೆ ಕಕ್ಷೆಯಲ್ಲಿ, ಆಂಟೆನಾವನ್ನು ಹಂತಹಂತವಾಗಿ ಬಿಡಿಸಲಾಯಿತು. ಮಡಿಸಿದ ಆಂಟೆನಾವನ್ನು ಮೊದಲು ಉಪಗ್ರಹದಿಂದ ಬಿಡಿಸಿ (hold down) ನಂತರ, ಆಂಟೆನಾವನ್ನು ಬಿಡಿಸಲು ಸಣ್ಣ ಗಾತ್ರದ ಡಿ.ಸಿ ಮೋಟಾರ್‌ನ್ನು ಬಳಸಲಾಯಿತು. ಮೋಟಾರ್‌ನಿಂದ ತಂತಿಯನ್ನು ಎಳೆದು ಸಂಪೂರ್ಣವಾಗಿ ಟ್ರಸ್ ಯಂತ್ರಾವಳಿಯನ್ನು ಹರಡಿಸಲಾಯಿತು.


ಚಿತ್ರ ೪: ಕಕ್ಷೆಯಲ್ಲಿ ಆಂಟೆನಾ ಬಿಡಿಸಿ ಹರಡಿಸುವ ರೀತಿ

ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಪರೀಕ್ಷೆ ಹಾಗೂ ಅಭಿವೃದ್ಧಿ:

ಮೊದಲಿಗೆ, ೨ ಮೀಟರ್ ವ್ಯಾಸದ ಸಣ್ಣ ಗಾತ್ರದ ಮಾದರಿ ಆಂಟೆನಾವನ್ನು ತಯಾರಿಸಿ ವಿವಿಧ ಪರೀಕ್ಷೆಗಳಿಗೆ ಒಳಪಡಿಸಲಾಯಿತು. ಪ್ರತಿಫಲಕದ ಮೇಲ್ಮೈನ ಆಕೃತಿಯ ನಿಖರತೆ, ಉಪಯೋಗಿಸಿದ ವಸ್ತುವಿನ ಗುಣಮಟ್ಟ, ತಯಾರಿಕಾ ರೀತಿಯ ಗುಣಮಟ್ಟ ಇತ್ಯಾದಿಗಳನ್ನು ವಿವಿಧ ಪರೀಕ್ಷೆಗಳ ಮೂಲಕ ಸಾಬೀತುಪಡಿಸಲಾಯಿತು. ಕಕ್ಷೆಯಲ್ಲಿ ಉಷ್ಣತೆಯ ಗಣನೀಯ ಏರುಪೇರು ಇರುತ್ತದೆ. ಪರಿಣಾಮವಾಗಿ ಪ್ರತಿಫಲಕದ ಮೇಲ್ಮೈನಲ್ಲಿ ಸಂಕೋಚನ–ವ್ಯಾಕೋಚನದಿಂದಾಗಿ ಆಕಾರ ವ್ಯತ್ಯಯ ಉಂಟಾಗುತ್ತದೆ. ಇದು ಒಂದು ಮಿತಿಯಲ್ಲಿರಬೇಕು, ಇಲ್ಲವಾದಲ್ಲಿ ಪ್ರತಿಫಲಕದ ಕಾರ್ಯಕ್ಷಮತೆಯ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುತ್ತದೆ. ಇದಕ್ಕಾಗಿ ಪ್ರಯೋಗಾಲಯದ ಶೀತೋಷ್ಣ ಕೊಠಡಿಯಲ್ಲಿ ಇರಿಸಿ, ಪರೀಕ್ಷಿಸಿ ಪ್ರತಿಫಲಕದ ಕಾರ್ಯಕ್ಷಮತೆಯನ್ನು ಖಾತರಿಪಡಿಸಲಾಯಿತು. ನಂತರ ಪೂರ್ಣ ಗಾತ್ರದ ಆಂಟೆನಾವನ್ನು ತಯಾರಿಸಿ ವಿವಿಧ ಕಂಪನ ಪರೀಕ್ಷೆಗಳನ್ನು ಮಾಡಿ, ಪ್ರಯೋಗಾಲಯದಲ್ಲಿ ಪೂರ್ಣಪ್ರಮಾಣದ 'ಬಿಡಿಸುವ' ಪರೀಕ್ಷೆಯನ್ನೂ ನಡೆಸಲಾಯಿತು. ಈ ಎಲ್ಲ ಪರೀಕ್ಷೆಗಳಿಂದ ದೊರೆತ ಮಾಹಿತಿಯನ್ನು ವಿಶ್ಲೇಷಿಸಿ, ವಿನ್ಯಾಸದಲ್ಲಿ ಸೂಕ್ತ ಬದಲಾವಣೆಗಳನ್ನು ಮಾಡಿ ಉಡಾವಣಾ ಯೋಗ್ಯ ಆಂಟೆನಾವನ್ನು ತಯಾರಿಸಲಾಯಿತು. ಈ ಆಂಟೆನಾವನ್ನು ಉಪಗ್ರಹದಲ್ಲಿ ಜೋಡಿಸಿ ಮತ್ತೆ ಎಲ್ಲ ಪರೀಕ್ಷೆಗಳನ್ನು ಪುನರಾವರ್ತಿಸಿ ಉಡಾವಣೆಗೆ ಸಿದ್ಧಗೊಳಿಸಲಾಯಿತು. ಚಿತ್ರ–೫ ರಲ್ಲಿ ಉಪಗ್ರಹಕ್ಕೆ ಜೋಡಿಸಿದ ಮಡಿಸಲ್ಪಟ್ಟ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ಕಾಣಬಹುದು.

ಉಪಸಂಹಾರ

GSAT-6 ಉಪಗ್ರಹದ ೬ ಮೀಟರ್ ಗಾತ್ರದ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನಾ ಯಂತ್ರಾವಳಿ ಆಂತರಿಕ್ಷದಲ್ಲಿ ಯಶಸ್ವಿಯಾಗಿ ಕಾರ್ಯನಿರ್ವಹಿಸಿತು. ಇದರ ಅಭಿವೃದ್ಧಿ ವಿವಿಧ ತಾಂತ್ರಿಕ ಶಾಖೆಗಳನ್ನೊಳಗೊಂಡ ಕ್ಲಿಷ್ಟಕರ ಸವಾಲಾಗಿತ್ತು. ಇದನ್ನು ನಮ್ಮ ಕೇಂದ್ರದ ವಿವಿಧ ವಿಭಾಗಗಳ ಸಂಪೂರ್ಣ ಸಹಕಾರ ಹಾಗು ಪರಿಶ್ರಮಗಳ ಕೊಡುಗೆಯೊಂದಿಗೆ ಸಾಕಾರಗೊಳಿ ಸಲಾಯಿತು. ತನ್ನ ಪ್ರಥಮ ಪ್ರಯತ್ನದಲ್ಲೇ ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ ನಿರ್ಮಾಣವನ್ನು ಸಾಧಿಸಿ ಯಶಸ್ವಿಯಾಗಿ ಕಾರ್ಯನಿರ್ವಹಿಸಿದ ಹೆಗ್ಗಳಿಕೆ ನಮ್ಮ ಯು ಆರ್ ರಾವ್ ಉಪಗ್ರಹ ಕೇಂದ್ರಕ್ಕೆ ಸಲ್ಲುತ್ತದೆ.

ಮುರಳಿ, ಎನ್ ಎಸ್
ಎಸ್ ಎಮ್ ಜಿ

ಚಿತ್ರ ೫: ಉಪಗ್ರಹದೊಂದಿಗೆ ಮಡಿಸಲ್ಪಟ್ಟ
ಅನ್‌ಫರ್ಲೆಬಲ್ ಆಂಟೆನ

WOULD HOT OR COLD WATER TURN INTO ICE FIRST?

If you haven't done an experiment, a Tanzanian school kid did back in 1963. Named after him the Mpemba effect is the observation that hot water freezes before cold water. He asked an explanation on this observation when Denis Osborne, a physicist visited his school. Inspite of the sniggering he recieved, Osborne tried it out and was surprised to find this effect and co-authored a paper with Mpemba in 1969. References to this observation date back to Aristotle but the observation itself have been debated. Often it turns out that there are differences in the experimental conditions between labs making it difficult to come up with a concise set of observations and supporting theoretical framework. A 2016 scientific report (Burridge and Linden) in Nature states that Mpemba effect is not a real effect. However out of the many possible explanations, a popular one is as follows:

H bonds and its network differs as water changes its state. For example there are none in water vapour, a few in liquid water and frozen as a network in ice. These bonds that hold the water molecules together as a network differs in strength. A simplistic explanation is that there are many more strong H bonds in hot water than in cold water such that while the cold water molecules have to re-shuffle (until the thermal energy is not enough for them to move) and figure out how their network should be in the frozen state while the hot water molecules already know that.

Is your home made ice cream quick if you freeze it hot? Find out!

हिंदी कार्यशाला रिपोर्ट

भारत सरकार, राजभाषा विभाग तथा संसदीय राजभाषा समिति के निदेशों के अनुसार, हिंदी के प्रगामी प्रयोग को बढ़ावा देने हेतु केंद्र द्वारा हर तिमाही में अधिकारी/कर्मचारियों के लिए हिंदी कार्यशाला का आयोजन किया जाता है। इस संबंध में, यू.आर.राव उपग्रह केंद्र द्वारा दिनांक 25.04.2018 को यू.आर.एस.सी. एवं नराकास (का.-1), बेंगलूरु के सदस्य कार्यालयों के प्रशासनिक क्षेत्र के अधिकारियों के लिए हिंदी अनुभाग द्वारा एक हिंदी कार्यशाला का आयोजन किया गया था। सर्वप्रथम, श्रीमती. गीता प्रसाद, हिंदी अधिकारी ने श्री. मनोहर एल वाणियर, वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन, प्रो. अमजद अली खान, मुख्य अतिथि एवं प्रतिभागियों का स्वागत किया। तत्पश्चात् प्रो. अमजद अली खान, निदेशक (प्रशिक्षण व विकास) एच.आर.डी. व अड्वान्समेंट, राष्ट्रीय संस्थान, नई दिल्ली ने सत्र का संचालन किया। कार्यशाला के दौरान उन्होंने राजभाषा के महत्व को बताते हुए राजभाषा की नीति, नियमों एवं अधिनियमों पर प्रकाश डाला और केंद्र में लागू विभिन्न प्रोत्साहन योजनाओं एवं प्रशिक्षण के बारे में सभी प्रतिभागियों को अवगत कराया। साथ ही उन्होंने "राजभाषा के कार्यान्वयन में वरिष्ठ अधिकारियों की भूमिका" विषय पर व्यावहारिक रूप से प्रशिक्षणार्थियों को विस्तृत ज्ञानवर्धक जानकारी भी प्रदान की।

इस कार्यशाला में कुल 80 प्रतिभागियों ने भाग लिया। श्री. जी.एन.वी. प्रसाद, उप निदेशक, एम.आई.एस.ए. एवं श्री. मनोहर एल वाणियर, वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन ने कार्यशाला के समापन समारोह की अध्यक्षता की। उन्होंने सभी प्रतिभागियों से अपील किया कि अपना दैनंदिन शासकीय कार्य हिंदी में करें और अपने सहकर्मियों के साथ हिंदी में वार्तालाप करें तथा आकस्मिक अवकाश, अर्जित अवकाश, चिकित्सा बिल, भविष्य निधि, अग्रिम आवेदन आदि मुद्रित प्रपत्रों को हिंदी में भरें। तदनंतर उप निदेशक, एम.आई.एस.ए. एवं वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन ने अपने कर-कमलों से सभी प्रतिभागियों को प्रमाण पत्र प्रदान किया और साथ ही उन्होंने हिंदी अनुभाग के सभी राजभाषा पदाधिकारियों को भी, कार्यशाला के सफल आयोजन के लिए बधाई दी।

कार्यशाला के अंत में श्रीमती सीना राजेन्द्रन, वरिष्ठ हिंदी अधिकारी ने सभी का आभार प्रकट किया।

राजभाषा सम्मेलन

नगर राजभाषा कार्यान्वयन समिति (का-1) के तत्वावधान में दिनांक 08.06.2018 को एक दिवसीय राजभाषा सम्मेलन का आयोजन किया गया। इस दौरान नराकास (का-1) एवं नराकास (का-2) के सभी सदस्य कार्यालयों के प्रधान एवं राजभाषा कर्मियों को आमंत्रित किया गया था। उद्घाटन सत्र में ईश्वर वंदना के साथ कार्यक्रम की शुरुआत हुई। श्री मनोहर एल. वाणियर, वरिष्ठ प्रधान, कार्मिक व सामान्य प्रशासन / अध्यक्ष, राजभाषा सम्मेलन आयोजन समिति, ने उपस्थित सभासदों का स्वागत किया। मंचासीन गणमान्यों द्वारा दीप प्रज्वलन किया गया। डॉ. ए.के. शर्मा, नियंत्रक ने सभा को संबोधित किया। डॉ. एम. अण्णादुरै, अध्यक्ष,

राजभाषा सम्मेलन

नराकास / निदेशक, यू.आर.एस.सी. ने समारोह की अध्यक्षता की तथा अध्यक्षीय भाषण दिया। डॉ. श्री प्रकाश शुक्ल, संयुक्त निदेशक, राजभाषा विभाग, नई दिल्ली इस समारोह के मुख्य अतिथि रहे। उन्होंने अपने भाषण के दौरान राजभाषा के महत्व तथा कार्यान्वयन के बारे में महत्वपूर्ण जानकारी दी। श्रीमती सीना राजेन्द्रन, वरिष्ठ हिंदी अधिकारी यू.आर.एस.सी. ने धन्यवाद ज्ञापन दिया। श्रीमती गीता प्रसाद, सदस्य सचिव, नराकास / हिंदी अधिकारी, यू.आर.एस.सी. ने मंच का संचालन किया। उद्घाटन के बाद श्री अशोक कुमार बिल्लूरे, संयुक्त निदेशक (रा.भा.) सेवा निवृत्त, अंतरिक्ष विभाग ने कल आज और कल विषय पर तथा डॉ. एस.एन. महेश, वरिष्ठ हिंदी अनुवादक, सी.ए.आई.आर. ने सूचना प्रौद्योगिकी एवं हिंदी उपयोगी साफ्ववेयर विषय पर व्याख्यान दिया एवं डॉ. विश्वनाथ झा, उपनिदेशक, सी.एच.टी.आई., नवी मुंबई ने राजभाषा संबंधी आदेशों की नवीनतम स्थिति विषय पर सत्र का संचालन किया। तदनंतर आभार ज्ञापन से सम्मेलन का समापन किया गया।

मासिक प्रतियोगिताएँ, अप्रैल-जून 2018

संघ सरकार की नीति के अनुसार राजभाषा के प्रचार-प्रसार एंव विकास की गति बढ़ाने हेतु केंद्र में प्रति माह एक हिंदी प्रतियोगिता का आयोजन किया जाता है। इस क्रम में 26 अप्रैल 2018 को केन्द्र के अधिकारी/कर्मचारियों के लिए हिंदी प्रश्नोत्तरी प्रतियोगिता का आयोजन किया गया। श्रीमती अंजु सिंह, वैज्ञानिक/अभियंता व समूह ने उक्त प्रतियोगिता का संचालन किया। प्रतिभागियों ने बड़े ही उत्साह से प्रतियोगिता में भाग लिया।

मई 2018 माह में गैर-हिंदी भाषी अधिकारी/कर्मचारियों के लिए 09 तारीख को हिंदी वार्तालाप का आयोजन किया गया, जिसमें किसी एक चयनित विषय पर हिंदी में वार्तालाप किया गया। डॉ. विनोद कुमार, वरिष्ठ वैज्ञानिक तथा श्रीमती सीना राजेन्द्रन, वरिष्ठ हिंदी अधिकारी उक्त प्रतियोगिता के निर्णायक रहे।

इसी श्रृंखला में तदनंतर दिनांक 12 जून 2018 को केंद्र के हिंदी भाषी अधिकारी/कर्मचारियों के लिए प्लास्टिक का उपयोग कहाँ तकक विषय पर हिंदी निबंध प्रतियोगिता का आयोजन किया गया।

श्रीमती सीना राजेंद्रन, वरिष्ठ हिंदी अधिकारी

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